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Western Australia has absolutely prohibited the introduction of rabbits, English sparrows, flying foxes, starlings, blackbirds and thrushes, and upon the recommendation of the Colonial Bureau of Agriculture can increase the list of proscribed species at any time. California has likewise prohibited the introduction of Australian rabbits, flying foxes, or other animals or birds detrimental to fruit growing, but while she may be able to prevent the direct importation of these pests she can not keep them out if they once become acclimated in neighboring States, for they would swarm in from the north or the east as readily as the English sparrow spreads from one State to another.

The remedy is simple. Congress should take steps promptly to protect Hawaii and Puerto Rico against further introduction of noxious species and to prevent the mongoose from being brought into the United States. The introduction of exotic mammals and birds should be restricted by law and should be under the control of the U. S. Department of Agriculture. The wild rabbit, the mongoose, the flying foxes and the mina of the Old World should be rigidly excluded, and species of doubtful value, such as the starling, skylark, kohlmeise and blackbird, should be imported with the greatest care, and only in places where they can be controlled in case they prove injurious.

T. S. PALMER.

WASHINGTON, D. C.

THE MENTAL EFFECTS OF THE WEATHER.

THE influence of the weather upon mental states has been a matter of comment since the days of the ancients, though but little scientific work has been done to determine, either qualitatively or quantitatively, just what the effect is. The weather maxims of wiseacres have been based very largely upon the peculiar activities of various members of the animal kingdom under definite

meteorological conditions—usually those immediately preceding a storm—but, aside from these literary curiosities, material bearing even indirectly upon the subject is extremely limited. The effect of climate upon racial traits has been much more fully treated, both by the anthropologist and the criminologist, and the literature of the subject is quite extended. We are most of us, however, convinced that, whatever racial differences may be ascribed to the varying climates of different parts of our planet, we as individuals are influenced in our conduct to a marked degree by varying meteorological conditions. Literature is full of allusions to such influences, and not a few of the world's great thinkers have left on record observations of such effects upon themselves.

The study which forms the basis of this paper is an attempt to throw some light upon the problem by comparing the occurrences of certain misdemeanors and other data of conduct, under definite weather conditions, with the prevalence of those conditions. The method of its prosecution was as follows: At the New York City station of the United States Weather Bureau the mean barometer, temperature and humidity, the total movement of the wind, the character of the day and the precipitation for each one of the 3,650 days of the years 1888–1897 inclusive were copied upon specially prepared blanks. From these records were then computed, by a process of tabulation, the exact percentage of days which were characterized as fair, partly cloudy, as rainy or clear, or as having come within a definite temperature group of 5° to 10°, 10° to 15°, 15° to 20°—and, in a similar manner, within arbitrarily determined groups for barometer, humidity and wind. In this way the normal prevalence of any definite meteorological condition was determined as a basis for comparison with the occurrence of the data studied.

The latter were taken from various records available in New York City and consisted for the most part of misdemeanors under the observation of the police force of the city, the teachers in the public schools and the warden of the penitentiary, although the death record kept by the Board of Health was also considered. The total number of data considered exceeded 400,000, made up of cases of assault and battery, suicide, and arrests for insanity by the police, recorded misdemeanor in the penitentiary and public schools, record of deaths for the city, record of errors made by clerks in several of the larger national banks and record of strength tests made in the gymnasium of Columbia University. The classes of data varied in number from 1,000 to more than 100,000, and were for the years included within the period for which the weather conditions had been tabulated. By a somewhat elaborate process of computation the exact percentage of each class of data occurring under each of the definite meteorological groups was determined; for example, the percentage on fair or cloudy days, on days when the temperature was between 15° and 20°, etc., for all the fifty or more conditions studied.

We have already stated that from the meteorological data, the normal prevalence of these conditions had been determined. It may be readily seen, however, that the normal prevalence of a condition equals the expected occurrences of each of the classes of data for that condition—for instance, if 30 % of the days for the ten years were fair we should expect 30 % of the assaults, suicides, etc., to have occurred upon fair days *if the character of the day had no influence*. If, however, 35 % did actually occur we should infer that the effect of fair days was to increase the number of assaults, as, indeed, this study has shown to be the case.

The conclusions of the paper are based entirely upon this comparison of occurrence

of data under a given meteorological condition, with the prevalence of that condition. Both were reduced to percentages. When the occurrence for a given condition was found to exceed the expectancy the exact *excess* was computed and when below the deficiency. More than one hundred and fifty curves were constructed showing these relations (see 'Conduct and the Weather,' Monograph Supplement No. 10 to *The Psychological Review*), a few of which are shown with this paper.

Moderately high temperatures were found to be accompanied by excess in all the misdemeanors considered; low temperatures by deficiencies. The temperature group 80–85° showing an excess of 68 % for assaults by males and 100 % for those by females. The next higher group, however, shows a drop to 33 % excess for the former and a deficiency of 33 % for the latter. This sudden falling-off for conditions of intense heat is shown for nearly all classes of data, and is undoubtedly due to the fact that under such temperature there is little energy available for offensive conduct. Death, suicide and the recorded error in banks alone remain excessive under such conditions.

Figs. 1 and 2 give a comparison of the occurrence of assault and death (male) referred to the temperature conditions for each month of the year. It may be seen from them that during the winter months the temperature produces but little effect, there being but slight excesses or deficiencies for any of the groups. Excesses and deficiencies read vertically. The horizontal lines show differences of 20 %, read from the heavier base lines.

When, however, we come to the spring, the higher temperature for the months are accompanied by a very marked increase in the number of assaults (April, 70–75°, an excess of 64 %) and one less marked for death. During the heated summer time

the highest temperatures do not show the greatest excesses for assaults, but the increase in the death rate is parallel with that of heat. During the unusually hot days in September and October we have about the same relation between the curves that was shown for the spring months—

which are themselves the effective ones—for instance, storms.

The study of humidity, in its effect upon the data of conduct gave some interesting results, since it demonstrated, beyond a doubt, that conditions of low humidity are those most productive of misdemeanor.

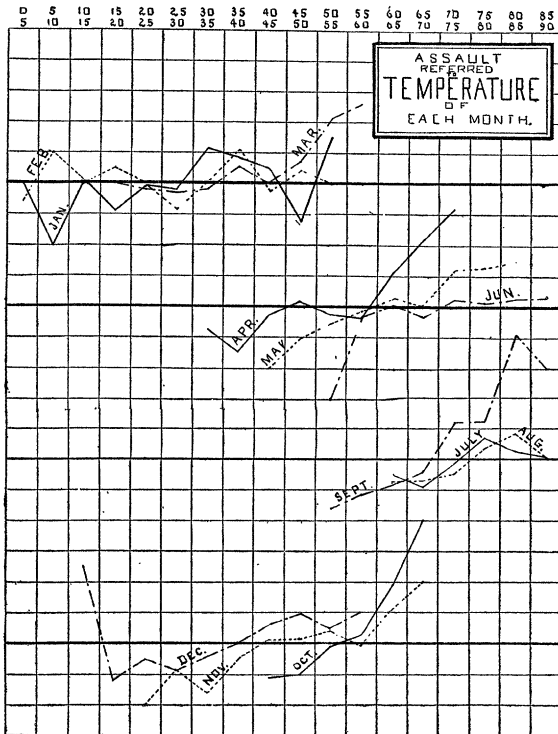


FIG. 1.

i. e., a great excess in assaults and only a moderate one in deaths. These relations are fairly conclusive, as they are based upon 36,000 assaults and 100,000 deaths.

Generalizations based upon the study of the barometrical conditions show that nearly all the data studied were excessive during low readings of the instrument. There are many reasons for concluding, however, that the actual density of the atmosphere is not the influencing factor here, but the barometrical conditions as accompaniments of other meteorological states

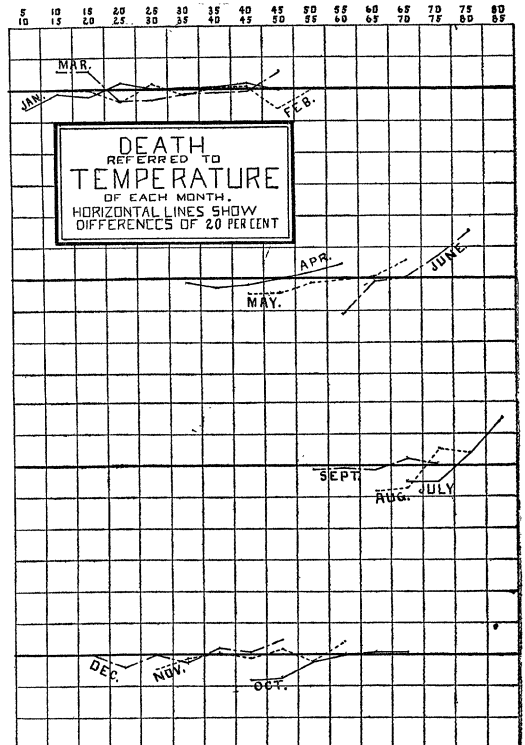


FIG. 2.

When we consider that the muggy, sticky days on which we feel it our natural prerogative to be 'out of sorts' are of the opposite character this is quite surprising. The deficiency of disorders on such days is, however, undoubtedly due to the fact that although they are emotionally depressing they are also physically weakening, and however 'ugly' a man might feel, if energy were lacking, to be offensively active the police court is none the wiser, and the fact is lost to our study. A tabulation of profanity or even a record of the ducking stool

of colonial days might give different results. In Denver, Colorado (see also 'Conduct and the Weather'), where the humidity is normally very low, the number of misde-

wind discloses the fact that misdemeanors of the classes studied show marked deficiencies during calm (-50%) with the greatest excesses during moderately high

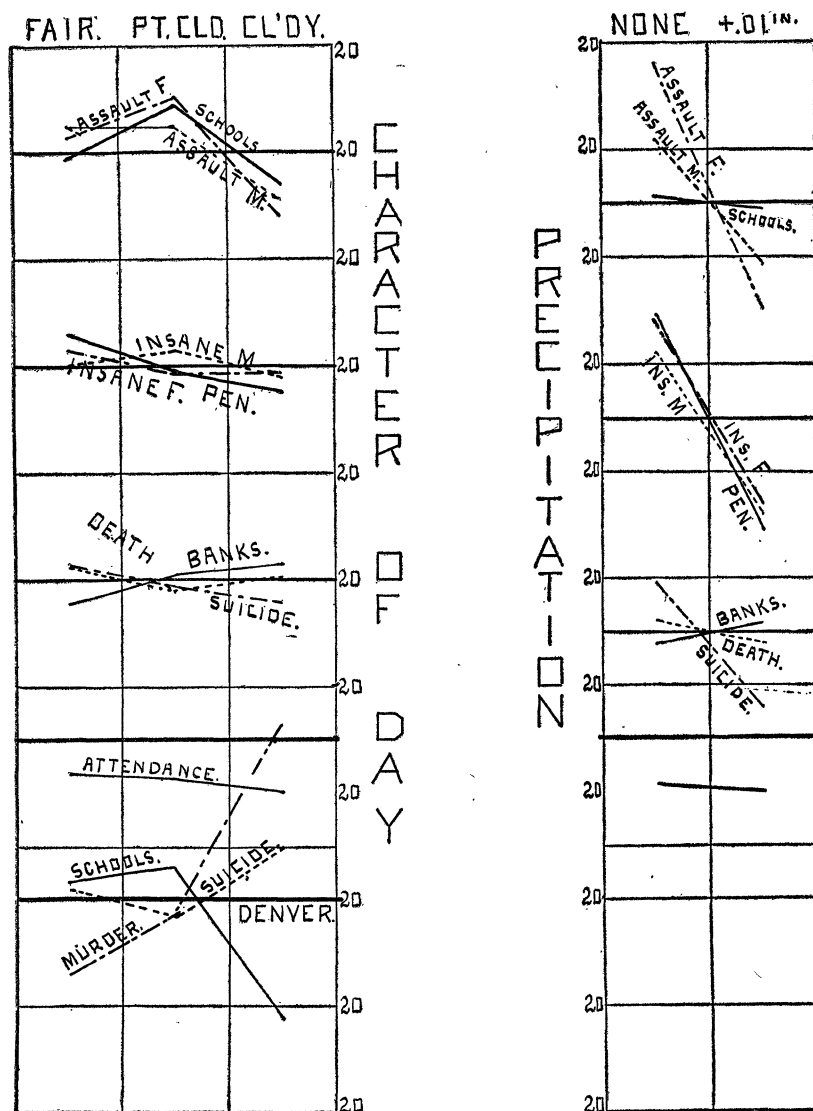


FIG. 3.

meanors reached an excess of more than 600% for readings between 15 and 25, which is a condition never experienced at the lower altitudes.

The study of the seeming effects of the

winds and moderate deficiencies again for great wind velocities. Death and suicide alone are excessive on calm days.

The state of conduct on days of different character—that is, fair, partly cloudy,

cloudy, rainy and clear—presents, I believe, a genuine surprise (see Fig. 3). This figure is to be interpreted in the same manner as the others. From it we see that misdemeanors are less frequent upon cloudy and rainy days (latter under 'Precipitation' marked '+ .01' in.) than upon those which we are accustomed to consider more agreeable. In fact, of all the classes of data studied, that for error in banks is the only one showing an opposite result. Reference to the curves shows that for assault by males (Assault M) the greatest excess occurred upon days characterized by the Weather Bureau as partly cloudy. Such days have from 4/10 to 7/10 of the hours from sunrise to sunset obscured, fair days having more than that amount of sunshine and cloudy days less.

Perhaps the most surprising curve is that for suicides, showing as it does that those who are weary of life choose the fair day, upon which there is no precipitation as the time for ending an unhappy existence. This, together with the fact that the months of May and June show the fullest record of suicides of any of the year, is directly contradictory to what seems to be the accepted opinion upon such matters. Perhaps fiction is largely responsible for the prevailing idea, and fiction would certainly lose much of its thunder if the proverbial gloomy weather could not be brought in for tragic effect. The prevailing climate may, however, influence these results, as the study for Denver (see 'Suicides' Denver upon the figure), where cloudy days are something of a rarity, their effect seems to have been more disastrous upon the suicide. There an excess of 32% is indicated for such days. The social conditions there, are, however, somewhat peculiar, as the population contains a large number of people who have gone to the region in search of health, which the sunshine was depended upon to restore, and the discouragement of even a brief dep-

rivation of its presence was too great to be borne. Even the death rate is shown by the curves to be slightly higher during bright weather, although the difference for days of varying character is not great.

Perhaps the most interesting general conclusion to be drawn from the study is that during those meteorological states which are physically exhilarating, excesses in deportment, in the ordinarily accepted sense of the word, prevail to an abnormal extent, while death and irregularities in mental processes (error in banks) are below expectancy. During such weather conditions, without doubt the quality of the emotional state is more positive than under the reverse conditions, but the results seem to show that in the long run an excess of energy is a more dangerous thing, at least from the standpoint of the police court, than the worst sort of a temper with no energy.

EDWIN G. DEXTER.

SCIENTIFIC BOOKS.

SOME RECENT WORKS ON MECHANICS.

Theoretical Mechanics, An Introductory Treatise on the Principles of Dynamics, with Applications and Numerous Examples. By A. E. H. LOVE. Cambridge, At the University Press. 1897. 8vo. Pp. xv + 379.

Vorlesungen über theoretische Physik von H. von Helmholtz. Herausgegeben VON ARTHUR KÖNIG, OTTO KRIGAR-MENZEL, FRANZ RICHARZ, CARL RUNGE. Band I., Abtheilung 2. Die Dynamik discreter Massenpunkte, herausgegeben von Otto Krigar Menzel. Leipzig, Verlag von Johann Ambrosius Barth. 1898. 8vo. Pp. x + 380.

One of the most original and suggestive of recent works on theoretical mechanics is the treatise on dynamics of Professor Love. The merits of this important book arise naturally from the author's point of view, and we are prepared to expect something more than stereotyped forms on reading in his preface that "The works which have been most useful to me in